

## CLAIMS

Having thus described the invention, we claim:

1. An apparatus for spraying powder coating material having a powder flow path, wherein said powder flow path has a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, said charging surface comprising a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.  
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- 15 2. The spray apparatus of claim 1 further comprising one or more air passages formed through said charging surface, said air passages being in a fluid communication with a source of compressed air.
- 20 3. The spray apparatus of claim 1 further comprising an electrical conductor provided adjacent said charging surface, said electrical conductor being connected to one of an electrical ground or a source of electrical potential.
- 25 4. The spray apparatus of claim 3 further comprising one or more air passages formed through said charging surface, said air passages being in a fluid communication with a source of compressed air.
- 30 5. An apparatus for spraying powder coating material having a powder flow path, wherein said powder flow path having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, further comprising one or more air passages formed through said charging surface, said air passages being in a fluid communication with a source of compressed air.  
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6. The spray apparatus of claim 5 wherein said charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

5        7. The spray apparatus of claim 5 further comprising an electrical conductor provided adjacent said charging surface, said electrical conductor being connected to one of an electrical ground or a source of electrical potential.

10      8. An apparatus for spraying powder coating material having a powder flow path through which said powder coating material flows, wherein said powder flow path has a first charging surface for triboelectrically charging powder coating material which comes in contact with said first charging surface, said first charging surface comprising a tribocharging material having a first charging polarity, said apparatus further comprising a component through which said powder coating material also flows, said component having a second charging surface which also comprises a tribocharging material having said first charging polarity.

15      9. The apparatus of claim 8 wherein said component is a spray nozzle.

20      10. The apparatus of claim 9 wherein said spray nozzle includes air passages which are in fluid communication with a source of compressed air.

25      11. The apparatus of claim 8 wherein said first charging polarity is a negative charging polarity.

12. The apparatus of claim 11 wherein said first charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

30      13. A system for applying powder coating materials to articles, said system including a powder feed apparatus for supplying powder coating material and an apparatus for spraying powder coating material received from said feed apparatus, said spraying apparatus having an electrode for charging said powder coating material a first charging polarity, said feed apparatus including a component having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, said charging surface being comprised of a tribocharging material having said first charging polarity.

5        14. The system of claim 13 wherein said component comprises at least one of a fluidizing plate, a hopper wall, a suction tube for a pump, a component of a pump or a hose.

10      15. The system of claim 13 wherein said charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polyamides.

15      16. The system of claim 13 wherein said spray apparatus includes a charging surface for charging said powder coating material said first charging polarity.

20      17. The system of claim 16 wherein said charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

25      18. A system for applying powder coating materials to articles, said system including at least one corona charging spraying apparatus and at least one tribocharging spraying apparatus, said corona charging spraying apparatus having an electrode for charging said powder coating material a first charging polarity, said tribocharging spraying apparatus having a powder flow path, wherein said powder flow path has a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, said powder coating material being charged to said first polarity by said charging surface of said tribocharging spraying apparatus.

30      19. The system of claim 18, wherein said first charging polarity is a negative electrical polarity.

35      20. The system of claim 19, wherein said charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

5        21. The system of claim 20, said system further including a powder feed apparatus for supplying powder coating material to at least one of said corona charging spraying apparatus and said tribocharging spraying apparatus, said feed apparatus including a component having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface,  
10      said component charging surface being comprised of a tribocharging material having said first polarity.

15      22. The system of claim 21 wherein said component charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

20      23. The system of claim 21 wherein said powder feed apparatus supplies powder coating material to at least one corona charging spraying apparatus and at least one tribocharging spraying apparatus.

25      24. The system of claim 18 wherein said corona charging spraying apparatus is used to coat a first part of said article and said tribocharging spraying apparatus is used to coat a second part of said article.

30      25. The system of claim 24 wherein said the second part of said article is a recessed part of said article.

35      26. The system of claim 24 wherein said corona charging spraying apparatus first applies powder coating material to said first part of said article and then said tribocharging spraying apparatus applies powder coating material to said second part of said article.

40      27. A tribocharging powder spraying apparatus, said apparatus including a body having an internal bore, a wear tube being located within said internal bore, an open passageway being provided between said internal bore and said wear tube, at least one air jet passageway being provided through said wear tube, said air jet passageway providing fluid communication between said open passageway and the interior of said wear tube, said wear tube having a charging surface for

5 triboelectrically charging powder coating material which comes in contact with said charging surface, said open passageway being in a fluid communication with a source of compressed air, whereby compressed air flows from said open passageway through said air jet passageway into the interior of said wear tube to affect the flow of powder coating material through said wear tube.

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28. The tribocharging powder spraying apparatus of claim 27 further comprising an inner wear surface located within said wear tube, said inner wear surface having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface.

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29. The tribocharging powder spraying apparatus of claim 27 wherein said charging surface comprises a negative tribocharging material selected from polyamide resin blends, fiber reinforced polyamides, aminoplastic resins and acetal polymers.

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30. A system for applying powder coating materials to articles, said system including a powder feed apparatus for supplying powder coating material and an apparatus for spraying powder coating material received from said feed apparatus, said feed apparatus including a component having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, said component charging surface being comprised of a negative tribocharging material selected from polyamide resin blends, reinforced polyamides, aminoplastic resins and acetal polymers.

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31. An apparatus for spraying powder coating material having a powder flow path, said powder flow path having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, further comprising one or more air passages formed through said charging surface, said air passages being in a fluid communication with a source of compressed air; and a tribocharging insert disposed within said powder flow path to shorten powder travel distances to impact said charging surface.

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5        32. The apparatus of claim 31 wherein said powder flow path is generally cylindrical and said insert is generally cylindrical and has a smaller diameter than said powder flow path.

10      33. The apparatus of claim 32 wherein said insert and powder flow path form an annulus, wherein powder passing through said annulus is tribocharged.

34. The apparatus of claim 33 wherein said air passages are upstream of said annulus.

15      35. The apparatus of claim 33 wherein said air passages open to said annulus.

20      36. An apparatus for spraying powder coating material having a powder flow path, said powder flow path having a charging surface for triboelectrically charging powder coating material which comes in contact with said charging surface, further comprising an air flow path coextending within said charging surface and spaced therefrom; said air flow path being defined by a wall having one or more air passages formed through said wall, said air passages being in a fluid communication with a source of compressed air.

25      37. The apparatus of claim 36 wherein said air flow path is defined by a tubular wall concentrically disposed within a larger tube that forms said charging surface.

30      38. The apparatus of claim 36 comprising a body that forms part of a spray gun; wherein said charging surface is formed in part by said gun body.

35      39. The apparatus of claim 36 wherein said air flow path wall comprises an outer surface that triboelectrically charges powder coating material that impacts said outer surface.

40. The apparatus of claim 36 comprising outer air passages formed through said charging surface.

5        41. A triboelectric powder coating gun having a component which includes a triboelectric charging surface, said component being capable of assembly into said gun in at least two different positional orientations.

10      42. The gun of claim 41 wherein said component when assembled into said gun has been rotated from a first position to a second position.

10      43. The gun of claim 41 wherein the direction of said component when assembled into said gun has been reversed from a first position to a second position.

14      44. A triboelectric powder coating having a component which includes a triboelectric charging surface, said component being connected to a holder to form a two piece assembly, said two piece assembly being assembled into said gun.

15      45. The gun of claim 44 wherein said holder includes one or more air jet passages.

15      46. The gun of claim 44 wherein said holder includes one or more electric ground elements.

20      47. A triboelectric powder coating gun having a triboelectric charging surface and an air jet which impinges on said charging surface, further including a ground element which is positioned upstream of said charging surface.